IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants	:	Joachim Schmitt
Serial No.	:	10/019,898
Filed	:	December 28, 2001
For	:	COMMUNICATIONS SYSTEM AND COMMUNICATIONS METHOD FOR AN AUTOMATION UNIT WITH COMMUNICATIONS DATA STORED IN SAID AUTOMATION UNIT
Examiner	:	Duyen My Doan
Group Art Unit	:	2143

CERTIFICATE OF TRANSMISSION UNDER 37 C.F.R. 1.8

I hereby certify that this paper is being electronically transmitted to the U.S. Patent and Trademark Office on the date indicated below.

Scott T. Weingaertner	37,756
Attorney Name	PTO Reg. No.
/Scott T. Weingaertner/	July 10, 2007
Signature	Date of Signature

Examiner Duyen My Doan
U.S. Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450

DATE: **July 10, 2007**
PAGES: **29 pages (including exhibits)**

DECLARATION UNDER 37 C.F.R. § 1.132

I, Joachim Schmitt, declare as follows:

1. I am General Manager at Siemens AG. I have been employed by Siemens AG since 03/1987 and have 10 years of experience working in the field of automation and drive technology. I offer this declaration pursuant to 37 C.F.R. § 1.132 in support of Siemens AG's Amendment in response to the non-final Office Action, dated January 10, 2007.

2. I have a degree in computer science (advanced technical college) which was conferred by Fachhochschule Würzburg-Schweinfurt in Würzburg, in 1987.

3. -

4. I understand that the present patent application, as amended, claims various aspects of a method and a system for operating and communicating with an automation-drive device over an automation-drive technology data network using a remote data processing apparatus running a browser.

5. I understand that the present patent application has been rejected because the invention as claimed is considered anticipated by a patent that allegedly relates to a system for remotely servicing a copier over a network from a workstation.

6. The field of automation and drive technology, or automation-drive technology, traditionally relates to a specific technology used in creating devices that automate in a factory, or industrial, setting. Automation-drive technology does not relate to mere automatic, or automated, network office equipment such as printers and copiers.

a. Exhibit 1 (attached) offers a general overview of automation-drive technology that defines "automation" technology as technology used to control industrial machinery and processes. Exhibit 1 begins by stating that "[a]utomation . . . or industrial automation or numerical control is the use of control systems such as computers to control industrial machinery and processes, replacing human operators." It explains that automation technology uses programmable logic controllers ("PLCs") "to synchronize the flow of inputs from (physical) sensors and events with the flow of outputs to actuators and events. This leads to precisely controlled actions that permit a tight control of almost any industrial process." In addition, human-machine interfaces ("HMI") or computer human interfaces ("CHI") "are usually employed to communicate with PLCs and other

computers, such as entering and monitoring temperatures or pressures for further automated control or emergency response.

b. Another portion of Exhibit 1 explains the role of automation in the manufacturing process. For manufacturing companies, the purpose of automation has shifted from increasing productivity and reducing costs to increasing quality and flexibility in the manufacturing process. For example, the transition from manual installation of automobile and truck pistons to installation by automated machinery has reduced the error rate from around 1-1.5% to 0.00001%. Indeed, hazardous operations, such as oil refining, the manufacturing of industrial chemicals and all forms of metal working are particularly suitable for automation. Flexibility and convertibility in the manufacturing process is another benefit of automation in that it allows manufacturers to easily switch from manufacturing one product to manufacturing a different product without having to completely rebuild their production lines.

c. Exhibit 2 (attached) includes excerpts of Milestones in Automation: From the Transistor to the Digital Factory by Arnold Zankl and describes the integration of drive and automation technology after 1996. In the preface of the book, on page 4, Prof. Dr.-Ing. Klaus Wucherer, Member of the Corporate Executive Committee of Siemens AG, describes automation engineering as "the backbone of industrial production," making plants (i.e., factories) safer and more productive. He describes the author as having 37 years experience in the field of "process and factory automation." He attributes progress in automation on the "innovative ability of Siemens and other manufacturers" along with business sectors including "power plant engineering, automakers and the process industry." Finally, Prof. Wucherer concludes by noting the

significant impact of automation-drive technology on "the most diverse industrial processes and technical systems."

d. On pages 192-199 of Exhibit 2, the author describes the integration of automation engineering and drives technology in the context of the automation of machinery and manufacturing and process automation in a factory setting. For example, after PLCs and intelligent drives on a system could be programmed from a programming device over one and the same bus, engineering tools for drives became integral components of automation environments. One notable trend in drives engineering described in Exhibit 2 includes "[t]he emergence of mechatronic systems in which mechanical components, such as line shafts, gears, couplings and cam disks, are replaced by microelectronics and software. Automation engineering responses to this and other trends in drives engineering included "Component Based Automation that benefited modularly designed machines and plants," "[t]he range of new motion control solutions for machines," and "[t]he addition to Ethernet of real-time solutions suitable for drives."

e. Page 193 of Exhibit 2 includes a figure that illustrates the application of automation-drive technology to process automation, factory/manufacturing automation and machine automation.

f. On pages 194-95 of Exhibit, the author describes how the principle of modularization, which had long been practiced in mechanical equipment manufacture and plant engineering, had, with the advance of mechatronics, started to attract attention in centralized factory automation, such as through a central programmable controller. This required that intelligent devices and modules from different manufacturers could be combined within a single factory automation environment. In this context, "module"

refers to factory or machine sections provided with the relevant automation functions by the mechanical equipment manufacturer or factory builder before shipping. The figure on page 195 illustrates this component based automation modularization concept extended to automation engineering in an automobile factory production line.

g. Pages 196-200 discuss the use of an "isochronous realtime" controller to allow for motion control of drive axes over a bus in a mechanical equipment manufacturing environment.

7. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that willful false statements and the like so made are punishable by fine or imprisonment, or both, under § 1001 of Title 18 of the United States Code and that willful false statements may jeopardize the validity of the application or any patent issued thereon.

Executed in Erlangen, on July 04, 2007.

Joachim Schmitt

Joachim Schmitt

EXHIBIT 1

Automation

From Wikipedia, the free encyclopedia

Jump to: navigation, search

For the Component Object Model-based Microsoft technology, see OLE Automation.

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This article has been tagged since **December 2006**.

KUKA Industrial robots engaged in vehicle underbody assembly

Automation (ancient Greek: = *self dictated*), **roboticization**[1] or **industrial automation** or numerical control is the use of control systems such as computers to control industrial machinery and processes, replacing human operators. In the scope of industrialization, it is a step beyond mechanization. Whereas *mechanization* provided human operators with machinery to assist them with the *physical* requirements of work, *automation* greatly reduces the need for human *sensory* and *mental* requirements as well.

Automation plays an increasingly important role in the global economy and in daily experience. Engineers strive to combine automated devices with mathematical and organizational tools to create complex systems for a rapidly expanding range of applications and human activities.

There are still many jobs which are in no immediate danger of automation. No device has been invented which can match the human eye for accuracy and precision in many tasks; nor the human ear. Even the admittedly handicapped human is able to identify and distinguish among far more scents than any automated device. Human pattern recognition, language recognition, and language production ability is well beyond anything currently envisioned by automation engineers.

Specialised hardened computers, referred to as programmable logic controllers (PLCs), are frequently used to synchronize the flow of inputs from (physical) sensors and events with the flow of outputs to actuators and events. This leads to precisely controlled actions that permit a tight control of almost any industrial process. (It was these devices that were feared to be vulnerable to the "Y2K bug", with such potentially dire consequences, since they are now so ubiquitous throughout the industrial world.)

Human-machine interfaces (HMI) or computer human interfaces (CHI), formerly known as *man-machine interfaces*, are usually employed to communicate with PLCs and other computers, such as entering and monitoring temperatures or pressures for further automated control or emergency response. Service personnel who monitor and control these interfaces are often referred to as stationary engineers.

Another form of automation involving computers is test automation, where computer-controlled automated test equipment is programmed to simulate human testers in manually testing an application. This is often accomplished by using *test automation tools* to generate special scripts (written as computer programs) that direct the automated test equipment in exactly what to do in order to accomplish the tests

Finally, the last form of automation is software-automation, where a computer by means of macro recorder software records the sequence of user actions (mouse and keyboard) as a macro for playback at a later time.

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[edit] Social issues of automation

Automation raises several important social issues. Among them is automation's impact on employment. Indeed, the Luddites were a social movement of English textile workers in the early 1800s who protested against Jacquard's automated weaving looms— often by destroying such textile machines— that they felt threatened their jobs. Since then, the term *luddite* has come to be applied freely to anyone who is against any advance of technology.

Some argue automation leads to *higher* employment. One author made the following case. When automation was first introduced, it caused widespread fear. It was thought that the displacement of human workers by computerized systems would lead to severe unemployment. In fact, the opposite has often been true, e.g., the freeing up of the labor force allowed more people to enter higher skilled jobs, which are typically higher paying. One odd side effect of this shift is that "unskilled labor" now benefits in many "first-world" nations, because fewer people are available to fill such jobs.

Some argue the reverse, at least in the long term. They argue that automation has only just begun and short-term conditions might partially obscure its long-term impact. Many manufacturing jobs left the United States during the early 1990s, but a one-time massive increase in IT jobs (which are only now being outsourced), at the same time, offset this.

It appears that automation does devalue labor through its replacement with less-expensive machines; however, the overall effect of this on the workforce as a whole remains unclear. Today automation of the workforce is quite advanced, and continues to advance increasingly more rapidly throughout the world and is encroaching on ever more skilled jobs, yet during the same period the general well-being of most people in the world (where political factors have not muddied the picture) has increased dramatically. What role automation has played in these changes has not been well studied.

One irony is that in recent years, outsourcing has been blamed for the loss of jobs in which automation is the more likely culprit[2]. This argument is supported by the fact that in the U.S., the number of insourced jobs is increasing at a greater rate than those outsourced[3]. Further, the rate of decline in U.S. manufacturing employment is no greater than the worldwide average: 11 percent between 1995 and 2002[4]. In the same period, China, which has been frequently criticized for "stealing" American manufacturing jobs, lost 15 million manufacturing jobs of its own (about 15% of its total), compared with 2 million lost in the U.S.[5].

Millions of human telephone operators and answerers, throughout the world, have been replaced wholly (or almost wholly) by automated telephone switchboards and answering machines (*not* by Indian or Chinese workers). Thousands of medical researchers have been replaced in many medical tasks from 'primary' screeners in electrocardiography or radiography, to laboratory analyses of human genes, sera, cells, and tissues by *automated systems.* Even physicians have been partly replaced by remote, automated robots and by highly sophisticated surgical robots that allow them to perform remotely and at levels of accuracy and precision otherwise not normally possible for the average physician. See Robot doctors and Surgical robots.

[edit] Current emphases in automation

Currently, for manufacturing companies, the purpose of automation has shifted from increasing productivity and reducing costs, to broader issues, such as increasing quality and flexibility in the manufacturing process.

The old focus on using automation simply to increase productivity and reduce costs was seen to be short-sighted, because it is also necessary to provide a skilled workforce who can make repairs and manage the machinery. Moreover, the initial costs of automation were high and often could not be recovered by the time entirely new manufacturing processes replaced the old. (Japan's "robot junkyards" were once world famous in the manufacturing industry.)

Automation is now often applied primarily to increase quality in the manufacturing process, where automation can increase quality substantially. For example, automobile and truck pistons used to be installed into engines manually. This is rapidly being transitioned to automated machine installation, because the error rate for manual installment was around 1-1.5%, but has been reduced to 0.00001% with automation. Hazardous operations, such as oil refining, the manufacturing of industrial chemicals, and all forms of metal working, were always early contenders for automation.

Another major shift in automation is the increased emphasis on flexibility and convertibility in the manufacturing process. Manufacturers are increasingly demanding the ability to easily switch from manufacturing Product A to manufacturing Product B without having to completely rebuild the production lines.

[edit] Safety issues of automation

One safety issue with automation is that while it is often viewed as a way to *minimize* human error in a system, *increasing the degree and levels of automation also increases the consequences of error.* For example, The Three Mile Island nuclear event was largely due to over-reliance on "automated safety" systems. Unfortunately, in the event, the designers had never anticipated the actual failure mode which occurred, so both the "automated safety" systems and their human overseers were innundated with vast amounts of largely irrelevant information. With automation we have machines designed by (fallible) people with high levels of expertise, which operate at speeds well beyond human ability to react, being operated by people with relatively more limited education (or other failings, as in the Bhopal disaster or Chernobyl disaster). Ultimately, with increasing levels of automation over ever larger domains of activities, when something goes wrong the consequences rapidly approach the catastrophic. This is true for all complex systems however, and one of the major goals of safety engineering for nuclear reactors, for example, is to make safety mechanisms as simple and as foolproof as possible (see Safety engineering and passive safety).

[edit] Automation Tools

Different types of automation tools exists:

- ANN - Artificial neural network
- DCS - Distributed Control System
- HMI - Human Machine Interface

- LIMS - Laboratory Information Management System
- MES - Manufacturing Execution System
- PAC - Programmable automation controller
- PLC - Programmable Logic Controller
- SCADA - Supervisory Control and Data Acquisition
- Simulation

A list of automation tools used in the IT field (past and present):

- AutoTester
- Kepware
- LabVIEW
- LineView based on National Instruments Lookout
- NovaTech Orion Automation Platforms
- QA Load
- QA Run by Compuware
- QuickTest Professional (QTP)
- Rational Robot
- Rockwell Automation
- SilkTest
- Simulink
- Telvent
- TestPartner by Compuware
- TestPro
- WET
- WinRunner
- Wonderware

[edit] See also

Robotics Portal

- Artificial intelligence
- Autonomous automation
- Controller
- Cybernetics
- Hardware architect
- Hardware architecture
- Home Automation
- Industrial Robot
- Machine to Machine
- Office Automation
- OPC
- OPC Foundation

- Process control
- Retraining
- Robot
- Systems architect
- Systems architecture

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Automation
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EXHIBIT 2

Milestones in Automation

From the Transistor to the Digital Factory

by Arnold Zankl

SIEMENS

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Printed in Germany

The big picture

Automation engineering is the backbone of industrial production today, making plants safer and more productive. Yet it was just 50 years ago that electronics made its entry into automation engineering by way of the transistor, triggering developments that no one in their wildest dreams could have imagined at the time.

Simatic was involved from the start – as one of the pioneers and pacesetters in the development of the first control systems with transistors, the introduction of programmable controllers, and the implementation of Totally Integrated Automation. Process computers and process control systems have been present throughout this journey and have vied with Simatic for the best solution in each case.

Arnold Zankl has succeeded in portraying this development as so continuous and inexorable that it might almost seem inevitable – despite the upheavals and paradigm changes that have shaped its course. One senses that the author has been a contributor close to the very heart of each of these developments during his 37 years in the mainstream of process and factory automation.

He draws on an abundance of different sources: Siemens customer magazines, product brochures, campaigns, and Rolf Hahn's book "SIMATIC – Erfolg mit System (success with a system)", a very detailed account, especially of the period before 1980. He has woven the technical developments, customer and industry requirements, strategies and entrepreneurial achievements on Simatic's journey into an informative and engaging narrative.

The details in this book remind us that progress in automation depended not only on the innovative ability of Siemens and other manufacturers, but also on the commitment of venturesome users and individual business sectors, such as power plant engineering, automakers and the process industry. The author closes with a brief look into the future to show how new advances can result from just this combination of innovative industrial concepts and progressive automation.

The remarkable success of Siemens in automation engineering is due not only to the technical excellence of its products, but also to a business strategy that has always set the right course at the right time for the company's global products, systems and solutions business. The story fascinates by showing how existing technical resources at a given time and a successful business strategy can effectively supplement and support each other.

This highly readable and handsomely illustrated book gives students, engineers and managers a clear perspective of the historical development and wide range of applications of a technology that has had an impact like almost no other on the most diverse industrial processes and technical systems.

Prof. Dr.-Ing. Klaus Wucherer
Member of the Corporate Executive Committee of Siemens AG

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2000 Integrated drive systems and Component Based Automation

Drive systems become a component part of TIA

Automation engineering and drives technology were technically independent areas to a large extent until 1996, when Totally Integrated Automation (TIA) was introduced. Only the proliferation of fieldbuses and the addition of isochronous operation and internode traffic made it practical to integrate drives and automation systems.

Not only the controller (PLC) but also the intelligent drives on the system could now be programmed from a programming device or PC over one and the same bus. As a result, the engineering tools for drives, previously stand-alone tools, became an integral component of the software environment of Simatic Step 7 in TIA. Both technologies, drives and automation, were now "integrated". Another ancient system boundary had been overcome by TIA.

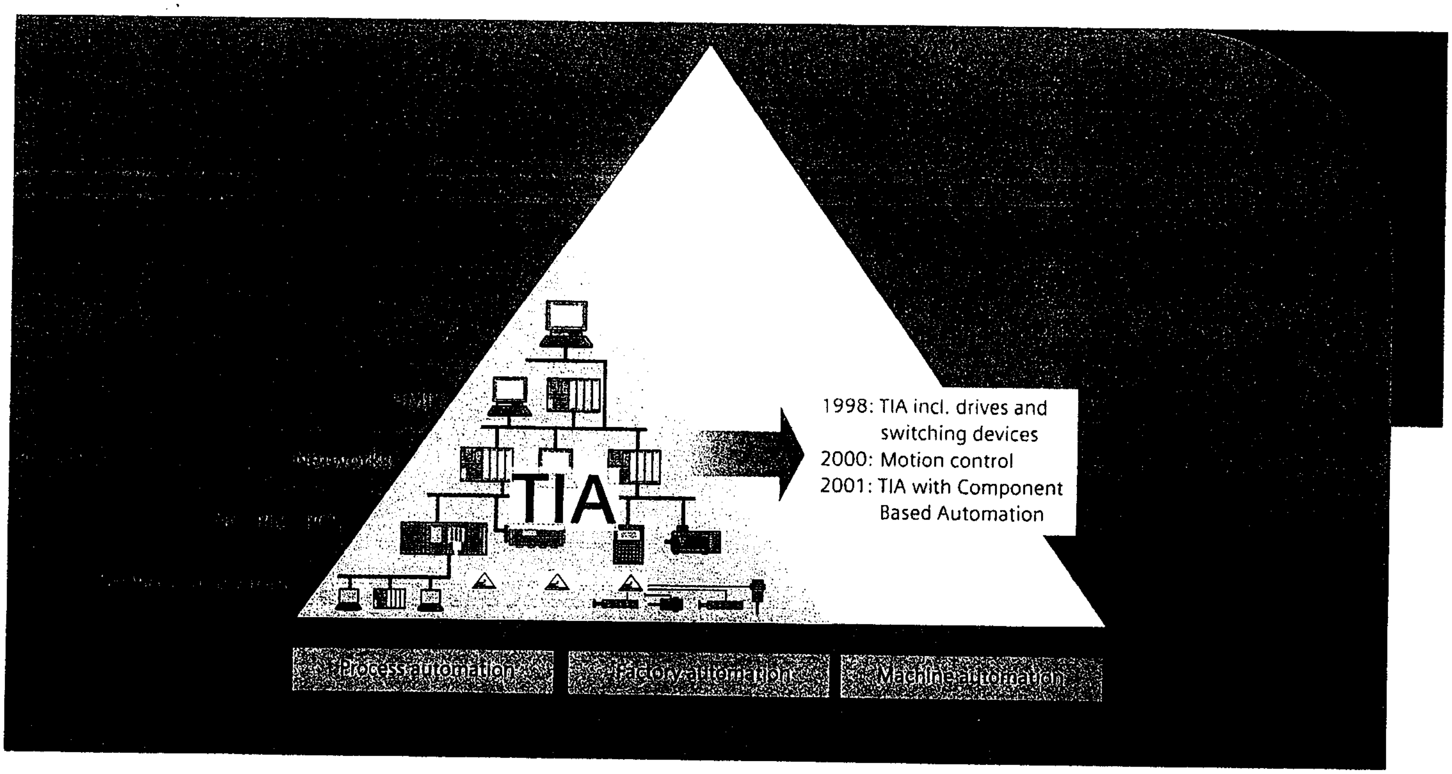
Of course, drives engineering continued to move on. Two recent trends deserve special mention:

- Advances in power electronics that resulted in smaller and lower-cost frequency converters and thus supported distributed systems
- The emergence of mechatronic systems in which mechanical components, such as line shafts and cams, are replaced by microelectronics and software.

Responses in automation engineering to these trends included, for example:

- Component Based Automation that benefited modularly designed machines and plants
- The range of new motion control solutions for machines
- The addition to Ethernet of real-time solutions suitable for drives.

The integration of drives engineering and Component Based Automation (CBA) provided an additional innovative impetus for Totally Integrated Automation (TIA). This made the automation of machinery an additional key application of TIA along with manufacturing and process automation.



Distributed intelligence in modular plant sections

The principle of modularization had long been practiced in mechanical equipment manufacture and plant engineering. Yet this technology had so far failed to attract much attention in centralized factory automation – for instance through a central programmable controller.

The breakthrough came with the distribution of intelligence and the advance of mechatronics. This advance led to autonomous, intelligent modules which then needed to be integrated into the automation environment.

The benefits of such Component Based Automation are obvious: Fully tested sub-solutions or modules can be re-used as often as required, tested in advance by the manufacturer, and later integrated into the overall plant without any problem.

Such a solution is only meaningful, however, if intelligent devices and modules from different manufacturers can be combined within one plant. And that requires uniform standards.

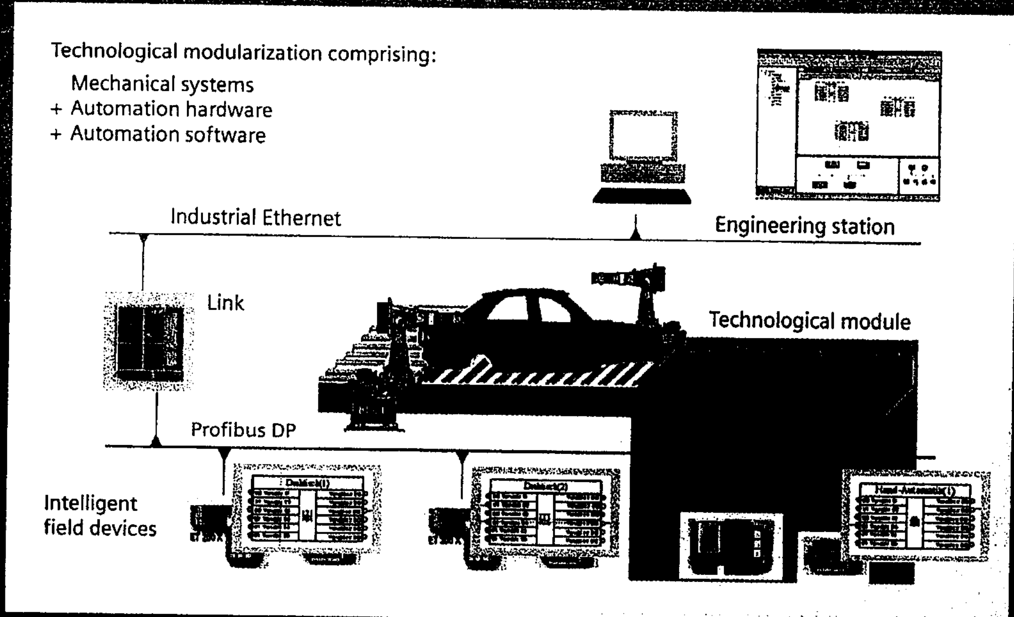
With Profinet Version 1, Profibus International presented such a standard in the spring of 2001. This version encompassed the component model, standard communication via Industrial Ethernet and plant-wide, vendor-independent engineering for interconnecting the technological modules. In this context, "module" denotes plant or machine sections provided with the relevant automation functions by the mechanical equipment manufacturer or plant builder before shipping.

At the engineering stage, communication between the modules is configured graphically. Detailed knowledge of communication functions, protocols and transmission media are not required here. Either Ethernet or Profibus can be used as a lower-level fieldbus for data exchange. The component model is based on COM/DCOM (Distributed Component Object Model) from Microsoft, the most widespread communication model of the office world.

Applications of Component Based Automation include the food and beverage industry, packaging machines, printing and paper machinery, paint shops and assembly lines.

The "Plug and Work" function of future production lines – comprising fully tested individual machines that configure themselves automatically in the network and communicate autonomously with each other – is still just a vision, but it is feasible in principle.

The distribution of intelligence and the advance of mechatronics gave rise to autonomous intelligent modules that had to be integrated into the automation environment.



Motion control with Realtime Ethernet

From around 2000 on, mechatronics developed into one of the most important trends in mechanical equipment manufacture, especially for packaging machinery, plastics machines and printing machinery. One by one, previous restrictions dictated by mechanical systems were overcome by individualization of the drives and intelligent motion control. Mechanical components such as cam disks, gears, couplings or line shafts gradually retreated and were replaced by software.

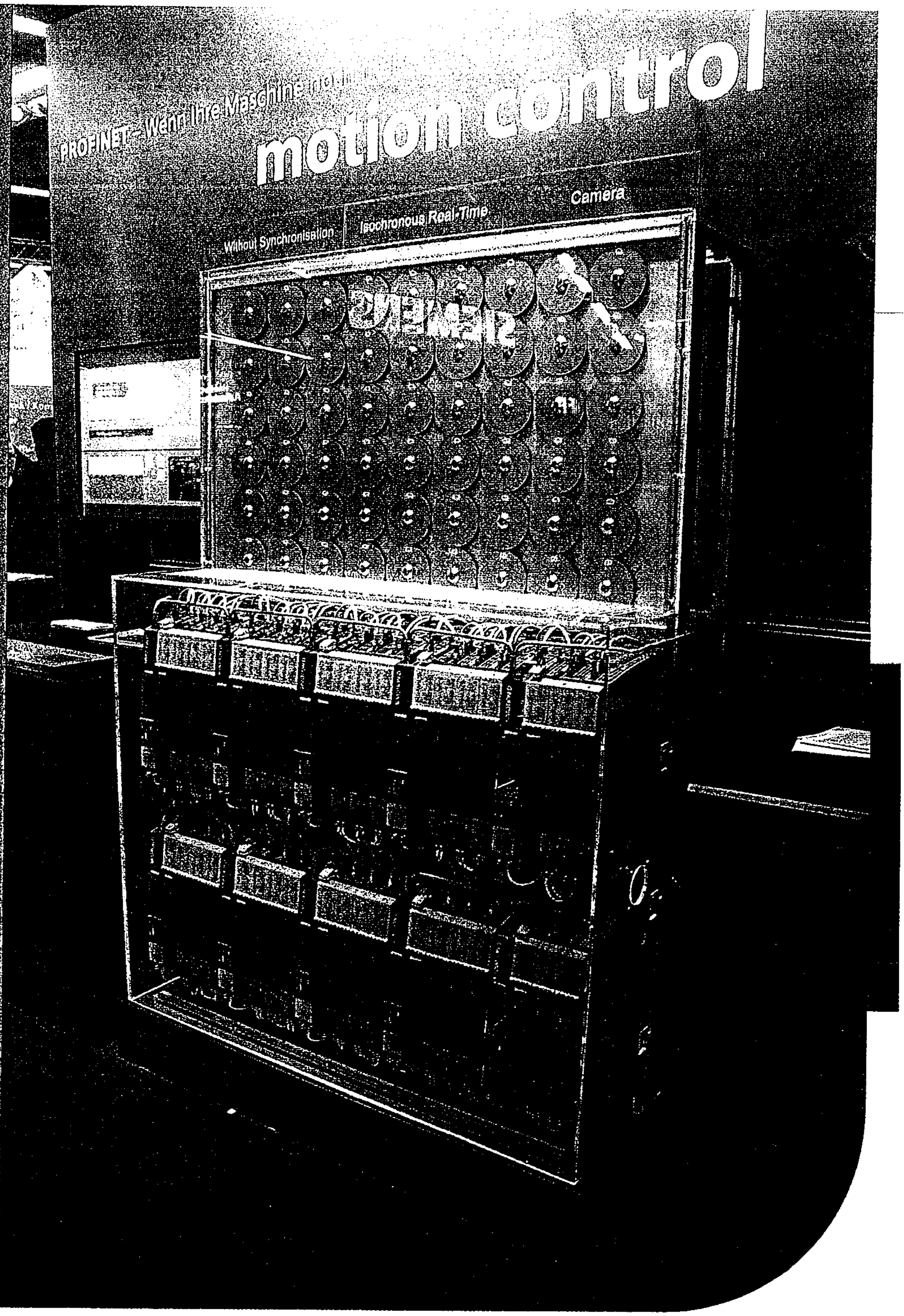
Motion control systems now assumed logic and motion control tasks. In Simotion – the Siemens system – motion control, logic elements and technology functions such as pressure and temperature control were integrated in a single system. Its runtime software can execute on different hardware platforms, so that an application, once created, can be loaded onto a Simotion controller, an industrial PC or an intelligent, distributed drive without costly adaptation. This is a benefit prized above all in modular mechanical equipment manufacture.

Isochronous applications, as required for instance in motion control, place special demands on the time characteristics of the bus system. This is where Profibus with its Profidrive profile approaches its limits, and with such tough requirements, Ethernet's non-deterministic behavior, hotly debated 20 years ago, proves after all to be a weak point.

One solution that provides a remedy is the "isochronous realtime (IRT)" procedure of Profinet. Profinet with IRT adds high-speed motion control applications and demanding closed-loop control tasks to the application area of Ethernet. IRT supports accurate synchronism of more than 100 drive axes over a bus with a deviation of less than one microsecond.

The special trick in this solution, worked out by Siemens researchers, is that the real-time expansions have no repercussions for the Ethernet standard functions.

The real-time expansions of Profinet have no effect on the Ethernet standard functions.



At the SPS/IPC/Drives trade show in Nuremberg, 2004, this demonstration system was used to present the real-time features of Profinet and motion control for the first time.

A user with a notebook, for example, can connect to anywhere on the Ethernet network to access device data without in any way jeopardizing the isochronous control.

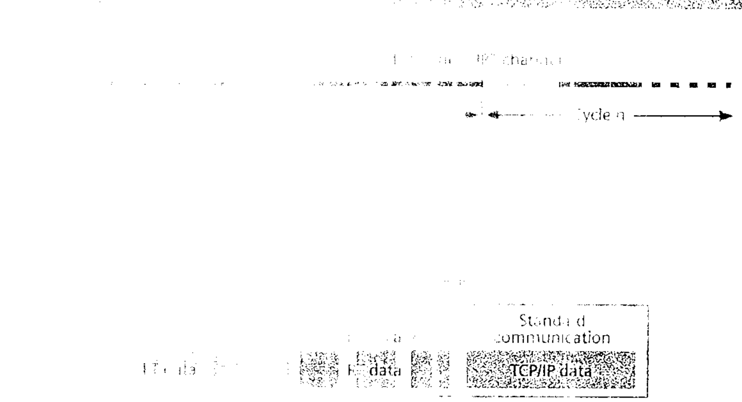
At the SPS/IPC/Drives 2004 trade show in Nuremberg, Siemens was the first to present the potential of IRT motion control through a demo system. Synchronous operation of 54 servo axes was unaffected even when video pictures were transmitted over the same Ethernet network. At extremely high network loads, only the quality of the video images suffered, but not the synchronous operation of the axes. This capability was achieved by installing the special IRT controller Ertec 400 (Enhanced Real-Time Ethernet Controller) in each of the ten motion control systems.

However, not every application has such extensive real-time behavior requirements. As well as isochronous realtime implemented by means of the special Ertec ASICs, high-speed, cyclic Ethernet communication can also be solved per software. The enabled response times of 1 to 10 ms are comparable with those of present fieldbuses.

The Profinet concept has become accepted by experts and users. Hence the 2003 decision by the Interbus Club to integrate Interbus into Profinet and push future developments jointly with PI. In addition, leading German automakers agreed in 2004 to use Profinet as their preferred Industrial Ethernet.

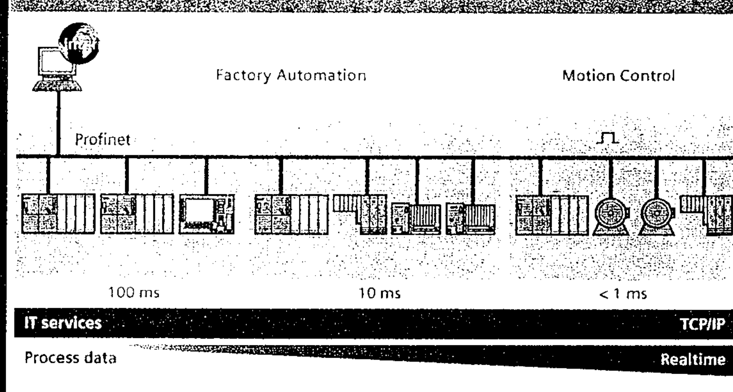
Planned expansions of Profinet in the direction of safety for failsafe systems and security for secure networks inclusive wireless LAN will further consolidate the position of Profinet and drive the advance of Industrial Ethernet into the field level.

In 2004, leading German automobile manufacturers agreed to use Profinet in the future as their preferred Industrial Ethernet.



With Profinet with IRT functionality, every communication cycle is divided into a deterministic section and an open section. This ensures that the isochronous real-time channel (IRT) cannot be interrupted by the standard communication (TCP/IP) running in parallel.

Profinet is an open and integrated system with scalable realtime from Industrial Ethernet (TCP/IP), through software-based realtime (RT), right up to isochronous realtime (IRT) for motion control.



Milestones in Automation

The evolution of automation is closely tied to the development of electronics and microelectronics. It began 50 years ago with pure hardware solutions, wired circuits and control systems. This was followed by the period of software orientation and programming, which in the last decade, the era of communication and information, finally led to the concept of Totally Integrated Automation.

If the mark left by development at the beginning was due to the implementation of what was technically feasible, today it is the opinion of the user that is the decisive factor: "What functions and interfaces must programmable controllers offer in order to fulfill the demands of multi-networked technical applications of widely varied complexity?"

The story told in this book therefore extends from the beginning of Simatic, the world's most successful programmable controller family, to today's state-of-the-art technology, enhanced by specific solution examples and a brief look into the future.

Easy to read and creatively designed, the book offers technicians, engineers and managers a profound look into the development history and possibilities for use of a technology which left its mark like no other on industrial processes and a huge range of technical systems.

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